**COMPARING IMAGES WITH VARIOUS ALGORITHMS**

1. **Pixel-by-Pixel Comparison**: Direct comparison of each pixel.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 1.0, Recall: 1.0, F1 Score: 1.0

Ideal for scenarios where images are guaranteed to be exactly identical or not.

1. **Hashing (Perceptual Hashing)**: Uses average hashing to compare images.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL** Precision: 0.06896551724137931, Recall: 1.0, F1 Score: 0.12903225806451613

Effective when images might undergo minor modifications but still need to be recognized as similar.

1. **Structural Similarity Index (SSIM)**: Measures the similarity between images using SSIM.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 1.0, Recall: 1.0, F1 Score: 1.0

Suitable for comparing images where structural changes are acceptable, such as images that are slightly edited or differently compressed.

1. **Histogram Comparison**: Compares the histograms of images.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 1.0, Recall: 1.0, F1 Score: 1.0

Useful for comparing images with similar colour distributions but different spatial arrangements or minor modifications.

1. **ORB (Oriented FAST and Rotated BRIEF)**: Uses ORB features for comparison.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 0.044444444444444446, Recall: 1.0, F1 Score: 0.0851063829787234

Ideal for cases where images might be scaled, rotated, or have minor distortions.

1. **Mean Squared Error (MSE)**: Measures the average squared differences between images.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 1.0, Recall: 1.0, F1 Score: 1.0

Best for exact matching scenarios or when comparing images where no modification is expected.

1. **Normalized Cross-Correlation (NCC)**: Uses normalized cross-correlation for comparison.

**IDENTICAL** Precision: 1.0, Recall: 1.0, F1 Score: 1.0

**NON-IDENTICAL**  Precision: 1.0, Recall: 1.0, F1 Score: 1.0

Effective for comparing images where one might be a shifted or differently scaled version of the other.

### RECOMMENDED ALGORITHM

* **For Identical or Nearly Identical Images**:

**Best Algorithms**: **SSIM** or **NCC**. SSIM is good for perceptual similarity, while NCC is effective for detecting exact matches with slight shifts.

* **For Images with Potential Transformations**:

**Best Algorithm**: **ORB**. It can handle transformations like scale and rotation well.

* **For Exact Pixel-by-Pixel Comparison**:

**Best Algorithm**: **Pixel Comparison**. Use this if you need a strict match without any tolerance for differences.